

ABSTRACT OF THE DISCLOSURE

A composite carbon fiber material is formed of one or more layers of carbon fiber material in which the carbon fibers are aligned all in the same direction and a mat of nonwoven, woven, or off-axis unidirectional carbon fibers are laminated together. Layers may be used individually or as a hybrid. The layers can be preimpregnated or impregnated during processing using thermoplastic or thermosetting resins. A layer of thermoplastic resin is applied either over the surface or within the composite structure, and the resin permeates the material so as to provide a more stable mechanical structure once the resin is processed. The material combines good mechanical strength with improved electrical current carrying properties when compared with the aligned carbon fiber layer alone. The layering sequence, layer type, and resin type can be specified to tailor electrical properties, mechanical properties, durability, and wear resistance. The resultant material achieves these results in substantially smaller material thickness than previously available.